

Pests That Prey on the Crops

Enormous Damage Done By Destructive Insects Every Year—How the Government Conducts Its Warfare Against Them.

By DEXTER MARSHALL.

When you visit Washington next time you may chance to wander through the shaded, park-like grounds in which the buildings occupied by the Department of Agriculture are located, and you may run across a curious, cage-like structure, ten or twelve feet square and eight or nine feet high.

Its frame is made of light wooden stuff and its walls of close meshed wire netting, through which the rain can beat, the wind can blow, and the sunshine fall the same as anywhere else. Inside you will see a few jars and flower pots, some on shelves close to the outside of the wire net cage, some sunken in the ground, and some otherwise disposed. In the jars and pots you will notice that plants and cuttings of various sorts are growing, and that on each growing thing there is some evidence that it is being attacked by a destructive insect.

If you hunt up some of the cages of the department and ask a few questions you will learn that it is the Entomological Bureau's "breeding cage" for the study of the insects which damage and destroy deciduous fruits of all sorts.

This inexpensive structure, then, which cannot have cost more than \$50 in the building and which most visitors probably would pass by unnoticed, plays a highly important part in the really great work of the best organized and most efficient machine for fighting man's insect enemies in the whole world. It is in charge of A. L. Quaintance, one of the bureau experts.

The Bee House.

Near by you will see a little peak-roofed house with solid wooden walls, painted white. Through little apertures in the walls close to the ground bees are entering and departing. You may enter it yourself if you like, and are not afraid of bees, through an ordinary door, for the little white building is not full of bees, as you might imagine. They are kept in hives built inside the structure so that the outer wall of it forms one wall of each hive. The bureau gives attention to the insects which help mankind as well as to those which damage crops. Bees, of course, stand at the head of the beneficial insects; silkworms come next.

Not far away stands the modest red brick building which houses the main offices of the bureau in charge of L. D. Howard, entomologist, with C. L. Marlatt, second in command. Each of these men does his full share of original investigation in addition to his supervisory work. Mr. Howard has given much attention to such pests as the brown tail and gypsy moths for a long time, and is now in Europe looking for ways to kill them off. Mr. Marlatt has been studying the damage to the insect enemies of wheat and other grains, which cost the country more than any other group of insects. I speak of them as a "group" because they attack similar crops, scientifically, they belong to many different groups.

Green Bug's Work Dwarfed.

Only those who have looked on the figures have any notion how expensive to the nation the insects of this country are. Mr. Marlatt says that such pests impose a heavier tax on the farmers of no other country. He places the average yearly loss at \$75,000,000, an almost unthinkable sum. Of this loss, \$40,000,000 falls upon crops and farm forests, \$15,000,000 upon animal products, \$10,000,000 upon natural forests and forest products, and \$10,000,000 upon products in storage.

The loss to the cereals—wheat, oats, barley, rye, and other grains—is about \$30,000,000 annually, year in and year out, whether there is any special visitation like that of the green bug, which made such a sensation in the Southwest this year, or not. It is estimated that it did about \$2,000,000 damage last spring.

The corn root worm, the boll worm (or ear worm), the chinch bug, and the Hessian fly average \$3,000,000 damage each year, more than double the damage done to wheat by the green bug this year. Besides, there are a lot of minor pests which damage crops that the public rarely hears of, and of which many farmers are ignorant, such as bill bugs, wire worms, cut worms, army worms, stalk borers, grasshoppers, corn plant lice—fifty important species, all told. Mr. Marlatt says, that do a total yearly damage of more than \$8,000,000 in all, or nearly nine times as much as that done this year by the green bug.

Great Damage to Wheat.

Wheat suffers from bugs and worms of various kinds, both actually and relatively, than any other crop. Corn is the biggest crop of the country, its value sometimes reaching and even exceeding \$1,000,000,000, with an average 8 per cent insect loss. The average loss from insects in wheat is about 20 per cent. On a crop worth \$500,000,000 this would be \$100,000,000, more than eleven times the damage done this year by the green bug. The Hessian fly and the chinch bug are more partial to a wheat than a corn diet even. Sometimes the Hessian fly fairly exterminates a large part of the growing crop.

Seven years ago it destroyed 40 per cent of the wheat in Ohio and 60 per cent in Indiana, the destruction being so complete that these percentages of the area planted to these grains were plowed under in the two States. Twenty per cent of the Michigan wheat area was abandoned also that year, and the decrease in the wheat crop of the whole country for 1890 from the Hessian fly alone amounted to not less than \$100,000,000.

It is rare that this fly does any such great damage, however. It is a little thing, although twice as large as the green bug, being about an eighth of an inch long. It looks somewhat like an undersized mosquito. As its name indicates, it is of European origin and it landed on American soil in 1776, coming here in the straw brought over by the Hessian troops. It first did serious damage to American wheat three years later.

Spread to New Zealand.

It has been on the wing ever since, and it reached New Zealand in 1888. It is attacked by several parasites, but about the only thing to do when the fly comes gets well at work in wheat is to plow the crop under. After a bad year, plowing the stubble in the fall is recommended in order to destroy the eggs, and so prevent the fly from getting a good start the next year. It is a good thing also, says Mr. Marlatt, to sow winter wheat very late, when the season appears to be favorable to the fly.

Still another and most ingenious scheme is to plant a "decoy" crop of wheat, early, in a narrow strip. The flies are attracted to this early wheat, and gather upon its spikes from the remainder of the field. At the proper time the strip, young wheat, Hessian fly, and all is plowed under as deep as possible.

after which the ground is thoroughly rolled, on the theory that a compact surface will prevent the maturing flies from escaping.

The chinch bug is a native of this country; it works on wheat until after the grain is harvested, when it migrates to the cornfields, for which reason the bureau recommends that the two crops should not be planted near together. In addition to this fly and the bug, wheat is attacked by mealybugs, plant lice, straw worms, army worms, and saw flies. The army worm is a native American, and when it really gets a start travels in great masses, whence its name, destroying everything before it. Like the grasshopper and the potato bug, the army worm seems to have been got under pretty fair control, and it is years since any of these pests has done any great damage.

The Terrible Green Bug.

I asked for some details about the green bug. Mr. Marlatt reached to the back of his roll-top desk and brought forth a pasteboard box from which he took a handful of dried wheat spikes, cut when they were green, each of which bore hundreds of what looked more like little brown, warlike insects than anything else. "There are a few thousands of them from Kansas," said he. "Also a few thousands of the parasites that kill them," referring to what seemed like tiny, sootlike dots on the bottom of the box.

On close examination the little brown worms showed their insect character clearly. Each was about a sixteenth of an inch in length, and a small round hole was found in the back of nearly every specimen in the collection.

"In every case," said Mr. Marlatt, "the hole means that a parasite has laid its eggs in the body of the bug and killed it. That is what happened to all but a very small proportion indeed of the bugs last spring. Not one in many thousands of them lived long enough after the parasite got to work to perpetuate their kind, although long before that they had destroyed great areas of growing wheat."

"The green bug is supposed not to be a native American insect. It was first reported in this country in 1882. It was found in abundance two years later in the wheat near Cabin John, Md., and that same year it appeared in Indiana, where F. M. Webster, the bureau's expert in the study of insects that destroy cereals and grasses, was carrying on his investigations. The bugs did little damage that year, however, but in 1890 they destroyed a large part of the wheat and oats in Texas, Arkansas, Missouri, Indiana, Illinois, Kentucky, and Tennessee. There was another visitation in 1900, but it was confined to Texas mainly."

Green Bug Here to Stay.

"The green bug, probably, is a permanent pest in this country," went on Mr. Marlatt. "It has never done serious damage except when there has been a warm, wet winter, followed by a wet, cold spring. Last January, W. D. Hunter, of this bureau, predicted the outbreak of last spring, for wheat and oats were then being destroyed by the bug in Texas; but, although the insect has been studied thoroughly, there was no way to prevent the damage. Nothing will kill it but its various 'parasitic' and 'predatory' enemies. There are several varieties of the parasites, all of which seem to be native, and present in sufficient numbers every year to insure the checking of the bug by the time the warm weather really sets in, but not early enough to save the crop after an open winter and a late spring. This is because the bug—which the bureau knows as the spring grain aphid—is able to work through an open winter, while the parasites are not favorable, the bug gets a big start on its enemies; when the winter and spring are normal the parasites go to work on the bug early, practically, as it goes to work on the crops, and there is no trouble."

"It is lucky that, while nature has given the bug great powers of survival and reproduction, she has provided an unusual number of ways of checking it. By May and June a certain species of ladybugs and their larvae begin to devour green bugs in great numbers. The ladybugs were not needed in Kansas this year, however; the parasites did the work effectually, and there was time for the ladybugs to get to work."

Ravages Not Checked.

"I can't say that I believe the efforts of the bureau or any one else did much to check the green bugs' ravages this year, much as I should like to, although everything was done that could be done. The bureau sent three men into the infested district. Finding that the parasite was busy wherever the green bug was found, these men sent quantities of young wheat, covered with dead green bugs and live parasites from Texas and Oklahoma, to Kansas in barrels for the farmers there to scatter in their infested fields, where both bugs and parasites got to work later than in Texas. S. J. Hunter, of the Kansas State University, sent out boxes of parasites infested with also, but the experts are agreed that millions on the back of millions of green bugs were doing business in the Kansas wheat fields before it was possible to get parasites from Texas at work."

"It is not likely that the green bug ever will do great damage in the Northern wheat regions. Even the open winters there are too cold to allow it to breed all through the season, as it can in Texas. Judging from the past, we shall not have another green bug pest until there is another open winter followed by a backward spring. The bug will survive, of course, and will begin work on the wheat in the Southwest next year and every normal year, but its enemies will be ready to begin on it quite as promptly. The green bug was first described by an Italian scientist in 1852. In June of that year it was so numerous in the city of Bologna as to cause great annoyance. A grain field infested with green bugs speedily turns brown. In health the bugs are bright green, as their popular name shows, but when attacked by the parasites they change color speedily."

Protecting Fruit from Moths.

The importance of Mr. Marlatt's special work is apparent from the wide distribution of the grain crops of the country and the equally widespread work of destruction done by the insect enemies of grain. Mr. Howard's special work in fighting the gypsy and the brown tail moths is no less important, although as yet these pests have not got west of New England, where they were first known in America. It is Mr. Howard's business to see that the insects in this country, which are the work of the bureau to confine to the cotton boll weevil to the Southwest, and he is prosecuting his task with intelligence, vigor, and enthusiasm.

The estimated damage done to fruit by insects in this country is \$2,000,000 annually, the total fruit crop being figured as worth \$13,000,000. Thus the percentage of damage is much less than the damage to wheat. Should the destructive moths ever get a foothold in the great fruit regions of the Middle West, in the orange

groves of Florida, the vineyards and orchards of California, and the apple orchards of the West, the damage would be incalculable. This is no exaggeration. These moths feed on practically all the trees and shrubs, as well as on fruit trees; the gypsy moth attacks pine, hemlock, spruce, cedar, and all other coniferous besides deciduous forest trees. Fifty-acre patches of forest, every tree on which has been killed by moths, are found in some places.

Both these moths came to Massachusetts first; the gypsy moth in 1869, brought by a Harvard professor, who wished to study it. The insect got away from him before he had been studying it long, and he notified everybody at once. Yet it was not noticed in large numbers until 1889. The brown-tail moth probably was brought here, in 1890 on rose plants, but it did not become a nuisance until 1897. Now both are found in many parts of New England; the brown-tail has gone as far as New Brunswick. The State of Massachusetts appropriated money to fight the gypsy moth soon after its dangerous character was realized, but in 1890 all work was stopped, not to be resumed until five years later, in 1904.

Fight Against the Moths.

Mr. Howard is enabled to give the help of the bureau and himself because of appropriations for that purpose, first made by Congress in 1895. The bureau is employing a large number of laborers to destroy moth nests in New England this summer. Both these moths are the prey of birds and parasites, but the native American insect-eating birds are not so numerous in New England as formerly, having been killed off by pot hunters, and driven away by the rapidly multiplying English sparrow, another importation. The sparrow does not eat the gypsy moth, but it does eat the brown-tail.

Both moths are attacked by several different parasites in Europe, over which they are spread very generally, and Mr. Howard's trip abroad last year has to do with their importation. Several importations, aggregating hundreds of thousands of parasites, were made in 1906 and 1906, but as yet it is too early to know how effective they will prove in this country. Many thousands of dollars have been

spent in spraying trees and otherwise poisoning the moths and in burning their nests. These methods of fighting them must be used if the moths are ever to be checked, but they are so expensive that individual use of them can never check the pests effectually. For several years Gen. S. C. Lawrence, of Massachusetts spent more money each year fighting the gypsy moth on his own and adjoining lands than the State of Massachusetts.

The Deadly Boll Worm.

Until the cotton boll weevil came to the United States from Mexico the boll worm was the most serious insect enemy of the cotton crop. It is quite as bad today as ever, but it has been overshadowed of late by the weevil.

It works quite differently in corn and cotton, and it attacks tomatoes, tobacco, peaches, nuts, beans, and okra. It is found in almost every land in the world, as far south as New Zealand and as far north as Denmark. It works at the sea level and is met in Africa, 5,000 feet above sea level, and in the Mexican mountains, at an altitude of 5,000 feet. It is supposed to be native American, and it has spread to China and Japan. It was not reported as an enemy of cotton until 1820. It did not attack corn, so far as known, until 1842.

It is not nearly so destructive elsewhere as in this country. It does more damage to sweet corn than to field corn, and it does more damage to field corn South than North. Sometimes when the plant grows rapidly the worm is squeezed to death between the rows of kernels as it is feeding on the ears. It has many enemies, including certain ants, beetles, wasps, spiders, and flies, which eat it. Woodpeckers and other birds also devour it. Half a dozen or more varieties of parasites have been introduced, but in the egg and in the larva.

It has been fought with poisoned sprays and poisoned sweets, but unsuccessfully by the latter. As it likes corn better than cotton, sprays of corn are often planted to catch the army for the protection of the latter, generally with success. Peas are planted in cotton fields for the same reason, and as successfully. The worm sticks to the corn and peas and is made to leave the cotton by the use of the phylloxera pest as they were before it was introduced into Europe.

The work of the Agricultural Department's Entomological Bureau is carried

on in complete harmony with the entomologists of the various State experimental stations. Not a little is being done by their inspectors in fruit-tree nurseries. All fruit stock found in this insect is infested with any injurious insect is destroyed invariably. Every year new ways of fighting noxious insects are discovered, and, undoubtedly, the damage done by them now is much less than it would be yearly were it not for the intelligent, never-ending fight against them that the national and State governments are keeping up.

Only the barest idea of the complete scope of this fight can be given here, however. It would require a thick volume to cover the ground in outline even. It includes the fighting of mosquitoes, house flies, and cattle ticks; a warfare against many insects injurious to forest trees, and the control of the Gifford Pinchot, chief of the Forestry Bureau, and many other things, all of which were briefly alluded to by Mr. Marlatt in his talk with the writer the other day.

The work of the bureau with bees and silk worms is as interesting as its insect war.

Some Trees Immune.

Incidentally, at the end of the talk Mr. Marlatt said that certain varieties of trees, plants, and vines are immune to certain insect pests. Thus the Le Conte pear, a rather coarse variety, is immune to the San Jose scale, which attacks practically every other sort of fruit tree. The reason for this immunity no one has been able to find as yet.

Incidentally, too, Mr. Marlatt drew attention to the fact that while many of our worst insect pests are imported, many equally destructive ones have been sent from this country to attack the crops and plague the farmers of the world. The phylloxera, which has so bedeviled French and other European grape growers, is one of these. Although native to this country and found in nearly all American grapes, it does not damage them materially, but it has been sent to Europe as a grape root or cutting it fastens on, even when planted in America. The salvation of the European vineyards was brought about by planting them with roots and cuttings from this country. By grafting, they are made immune to the European varieties of grapes, and to-day the European vineyards are almost as free from the phylloxera pest as they were before it was introduced into Europe.

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DISPUTED POINTS IN HISTORY

By FREDERIC J. HASKIN.

For four centuries the little island of San Salvador enjoyed the distinction of being that bit of land which Columbus found in October, 1492, when he opened a new world to Christendom. Then San Salvador had to give way to another little island, even more insignificant, because it was demonstrated that Columbus had not been landed on San Salvador.

While much is made of the treason of Benedict Arnold, and every school child has heard and read of him, little is said in the ordinary school histories of the treason of Gen. Charles Lee, who was once second in command to Washington and who died following in the struggling colonies that greatly embarrassed the commander-in-chief. Arnold's treason was found out at once, but it was eight years before it became known that Gen. Lee, as a prisoner of war in New York, was giving the English army his brother plans of American defenses, and advising the expedition to Chesapeake Bay which ended, fortunately, in the utter defeat of the British. "Charles Lee was an Englishman," wrote the English historian, "and he was not a traitor as he was thought to be. He was not a relative of the Lee family of Virginia."

When one hears of the "blue laws" of the old New England colonies, the first thing to pop into the mind is the solemn: "No woman shall kiss her child on the Sabbath or fasting day." Such an absurd statute was not to be found in the mind of even the sternest Puritan. The quotation is from "The General History of Connecticut," published in 1831 by the Rev. Samuel Peters. Mr. Peters invented a code of blue laws for the graphic illustration of the laws which really had been in existence, and the one forbidding a mother to kiss her child is a selection from the Peters code. It is an exaggeration in absurdity only, however, and not in severity, for the real law prescribed exile on pain of death for persons holding to the faith of Quakers, while in Virginia a man who neglected to attend church three successive times was liable to death.

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Longfellow's "Skeleton in Armor," have pointed to the old stone tower at Newport, R. I., as the one tangible proof that the Norsemen not only discovered America, but settled Vinland four centuries before Columbus. It has made a good story, and the boys and girls in school were always sorry there was not more to tell about it. Now it is declared on the best authority that the tower is not of Norse origin at all, but was built by Benedict Arnold, first governor of the United colonies of Rhode Island and Providence Plantations, and grandfather of Benedict Arnold, the traitor of the war of independence.

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There is a delightful story that Frederick the Great, of Prussia, sent a hand-sword to Gen. Washington with the message: "From the oldest general in Europe to the greatest general in the world." Washington made no mention of this sword, and nothing escaped his diary. He did receive a sword from Theophilus Alfe, a German, in 1755, which was bequeathed in his will. Only once did Frederick write to Gen. Washington, and that was a mere passing reference to the early campaign around Boston. If he thought him "the greatest general in the world" he might have said something more. Nevertheless, the story made good.

Longfellow's "Skeleton in Armor," have pointed to the old stone tower at Newport, R. I., as the one tangible proof that the Norsemen not only discovered America, but settled Vinland four centuries before Columbus. It has made a good story, and the boys and girls in school were always sorry there was not more to tell about it. Now it is declared on the best authority that the tower is not of Norse origin at all, but was built by Benedict Arnold, first governor of the United colonies of Rhode Island and Providence Plantations, and grandfather of Benedict Arnold, the traitor of the war of independence.

Gov. Arnold mentions the "stone-built wind-mill" in his will, and it was not very old at the time of Arnold's death, in 1678.

While much is made of the treason of Benedict Arnold, and every school child has heard and read of him, little is said in the ordinary school histories of the treason of Gen. Charles Lee, who was once second in command to Washington and who died following in the struggling colonies that greatly embarrassed the commander-in-chief. Arnold's treason was found out at once, but it was eight years before it became known that Gen. Lee, as a prisoner of war in New York, was giving the English army his brother plans of American defenses, and advising the expedition to Chesapeake Bay which ended, fortunately, in the utter defeat of the British.

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